2 The Proposed Scheme

2.1 Introduction

This chapter provides an overview of the proposals for Line One of the Edinburgh Tram. It describes the proposed route of the tram, and outlines the key elements of the design of the scheme. It also describes how the scheme will be constructed and operated.

2.2 Scheme Description

2.2.1 The Preferred Route Alignment

The proposed alignment for Line One is 15.5 km (approximately 10 miles) long. It will connect the city centre with Granton along the line of the former Roseburn Railway from Haymarket, pass through the Waterfront Edinburgh Ltd (WEL) development area in Granton to Newhaven and Leith and then run back to the city centre along Leith Walk.

The tram alignment follows various forms. In some sections the tram route is entirely separate from road corridors and traffic. Here it is referred to as 'segregated'. Where the alignment is separated from the road corridor, but adjacent to a road, it is referred to as a public transport corridor or 'segregated on-street'. Sections which are described as 'integrated' with traffic (or 'joint running') run on-street and share part or all of the road carriageway with existing traffic including buses, taxis, cars, cycles and commercial vehicles.

In terms of distance, 68% (10.5km) of the route is entirely segregated from traffic, 17% (2.7km) follows a segregated on-street public transport corridor, and 15% (2.3km) is joint running (integrated with traffic).

Wherever possible, a segregated alignment has been proposed so that the tram system can maintain speed, frequency and reliability of service without interference to or from other traffic.

Sections of the route which are along public transport corridors or which are fully segregated will incorporate access points for emergency vehicles. This will be particularly important where the tram follows the segregated alignment along the former railway corridor between Roseburn and Ferry Road.

The route has been divided into the following sections to assist in the project description and further details on each are provided in *Sections 2.2.2* to *2.2.5*.

- Section 1 – Princes Street West to Drylaw (South West Section);
- Section 2 – Drylaw to Lower Granton Road (North West Section);
- Section 3 – Lower Granton Road to Leith Walk South (North East Section); and
- Section 4 – Leith Walk South to Princes Street West (South East Section).

The four route sections correspond with a series of four 'route window' figures which have been used for mapping of environmental features in some sections of this ES. The extent of these four sections is indicated on *Figure 2.1*. The approximate locations of tram stops (1), are also shown on *Figure 2.1*.

(1) The final locations of stops have yet to be confirmed (see *2.3.3*).

2.2.2 Section 1: Princes Street to Drylaw (South West Section)

The first section of the proposed route follows an integrated on-street alignment along Princes Street, Shandwick Place and West Maitland Street as far as Haymarket Railway Station. From the station, the route will follow a short section of segregated alignment along the southern edge of Haymarket Terrace. It then runs on-street through Haymarket Yards for a short distance, before turning west to run behind (north of) the new commercial buildings at Elgin House (Inland Revenue) and the Chartered Institute of Accountants. The alignment then runs parallel (and north of) the existing Edinburgh to Glasgow railway lines west of Haymarket Station, with new residential flats along Balbirnie Place to the north. At the western end of this residential area the tram route turns north onto the formation of the former Roseburn Railway.

The alignment then follows the former railway corridor northwards, crossing over the A8 Glasgow Road at Roseburn Bridge and over the Water of Leith at Coltbridge Viaduct. Along this section of the route, the tram will be segregated from road traffic. The corridor generally has well-vegetated side slopes (embankments and cuttings) on either side of a route currently used as a pathway and cycleway throughout.

Residential properties are located close to the railway corridor, often at the top or base of cuttings and embankments. The corridor also has a number of access points (via ramps or steps), which provide a connection to local roads or paths for residents, pedestrians and cyclists. The former railway route is crossed over and under by a number of side roads between Roseburn and Craigleith and by the A90 Queensferry Road immediately south of Craigleith.

At Craigleith the alignment of the railway becomes more level and open, although it remains largely flanked by residential properties as the route progresses north to the point where it passes under Telford Road in the Drylaw area of the city.

2.2.3 Section 2: Drylaw to Lower Granton Road (North West Section)

The alignment leaves the railway corridor at Ferry Road and follows a reserved (1) corridor along the western side of the West Granton Access Road as far as the southern boundary of the WEL site. The tram route crosses the WEL site, turning eastwards midway through the site and following an access road to link with West Harbour Road, where the tram will run on-street to Granton Square.

East of Granton Square, the alignment runs adjacent to Lower Granton Road following the course of a former railway alignment between the road and the sea front. From the intersection of Lower Granton Road and Trinity Crescent, the tram will run on-street and integrated, along Trinity Crescent then eastwards along Starbank Road. The northern footway along Starbank Road will be widened to allow for integration of trams, road traffic and maintenance of pedestrian facilities. This will require a new structure which will be constructed along the face of the existing sea wall to support the widened footway.

2.2.4 Section 3: Lower Granton Road to Leith Walk South (North East Section)

East of Starbank Road, the route initially follows an on-street alignment along Lindsay Road before running on a segregated section adjacent to the industrial access roads from the flour mills at Newhaven to Ocean Terminal. At Ocean Terminal the route is again integrated with road traffic and turns north then east onto Ocean Drive which follows the boundary between Leith Port (to the north) and Victoria Quay (to the south).

(1) When the approach road was constructed in the 1990s, a wide verge was left between the western edge of the road and the road boundary for future use as a public transport corridor.

A small roundabout at the eastern end of Ocean Drive marks the point where the tram alignment turns south and joins Constitution Street. A tram depot serving Line One will be located adjacent to this roundabout, on the eastern side of Constitution Street (see *2.3.9*).

The tram will follow an on-street integrated alignment along the length of Constitution Street and then onto Leith Walk. On Leith Walk, which is a dual carriageway road, the northbound and southbound tram lines will follow the outside lanes of each carriageway (those nearest to the central reserve) with central island platforms at the proposed tram stops.

2.2.5 Section 4: Leith Walk South to Princes Street (South East Section)

This section is entirely on-street and the tram will be integrated with traffic. The alignment continues southwards along Leith Walk to the roundabout intersection with Picardy Place. From Picardy Place, the route continues west along York Place/Queen Street to the intersection with St Andrew Street. Residential and commercial buildings line either side of York Place and Queen Street, which generally consist of four lanes of traffic with pathways on either side of the road.

The twin track alignment then splits with single tracks following the length of both St Andrew Street and St David Street. The tracks then rejoin on Princes Street west of South St David Street.

2.3 Tram System Infrastructure

2.3.1 Tramway Profile

The profile of the tram system will vary according to the type of alignment adopted:

- Where the tram runs on-street and is integrated with traffic (*ie* as joint running with traffic or combined with a bus lane), rails will be installed within the road carriageway and traffic will mix with trams. There will be no physical barriers between tram lanes and traffic lanes, and no barriers between tram lanes and footways at the side of the road.

- Where tram alignments are on-street but segregated, the tram will run on a dedicated section of road adjacent to existing traffic lanes but there will be no mixing of tram and road traffic. In some cases there may be physical separation of the tram alignment from traffic lanes.

- The off-street tram alignment following the former railway corridor from Roseburn to Ferry Road, will run alongside the adjacent footway and cycleway. At present there are no firm proposals for physical segregation between them but this can be provided if required. On level and embanked parts of this section, fencing will separate the tramway from adjacent properties to prevent pedestrian access to the tram system other than via recognised access points.

In all on-street alignments, pedestrian crossings will be provided to allow safe crossing of roads and/or tramways. Pedestrian crossings will also be provided in all locations where tram stops are located in the centre of roads (island platforms) so that pedestrians can cross to and from the tram platform from footways at the edge of the carriageway.

The width of the tramway is typically 3.5m per lane on street running sections, although this may increase on bends and where centre poles are required to support power cables. On the railway corridor the tramway will be approximately 7.5m in width (for the two rails combined and central poles) although this will increase in the vicinity of tram stops where side platforms are required adjacent to each track. In some locations, particularly under the road bridges which cross over parts of

the former railway corridor, the tramway width will be narrowed to allow sufficient room for both the tramway and the adjacent footway and cycleway to pass between the sides of the bridge.

A typical cross section of the tramway, showing the profile for the tram in the Roseburn Railway Corridor is shown in *Figure 2.2*.

2.3.2 Tramway Surfacing

The 'tramway' comprises the area within and on either side of the rails laid for the tram vehicles which is enclosed by the 'swept path', plus a separation distance between the swept path and adjacent road uses (*eg* adjacent kerbs, footways, fences or road traffic lanes). The 'swept path' of the tram is the area or footprint which is covered by tram vehicles following the tram track alignment.

On street running sections, the tramway will be constructed on a reinforced concrete track slab which provides sufficient structural strength to support traffic and tram vehicles. Steel rails will be fixed within the track slab. In off-street sections, rails may be fixed within a concrete slab or in supports such as unit slabs which allow for grass seeding between the rails ('grasscrete'). The surface treatment elsewhere along the route will be specified in accordance with local circumstances as set out in the Design Manual (see *2.4*).

2.3.3 Tram Stops

For the purposes of this assessment the scheme has been assumed to include a total of 22 tram stops, located at approximately evenly distributed distances around the loop (see *Figure 2.1*). The final location of tram stops will not necessarily be exactly as shown, however, the design has been developed to provide a sufficient information about stop locations to enable a reasonable assessment of environmental impacts. Final locations and designs will be subject to a system of 'Prior Approvals' under Part 11 of Schedule 1 to the *Town and Country Planning (General Permitted Development) (Scotland) Order 1992* described in *Section 3.2.3*.

The design of tram stops will depend upon the alignment of the tramway in relation to existing roads and streets. For example, along Leith Walk where the tram alignment uses the outside (central) lanes of the dual carriageway road, island stops will comprise a single platform between the parallel tram tracks. In off-street and segregated alignments, tram stops will generally comprise two side platforms, one on the outside of each tram line.

Tram platforms will be raised slightly above the level of the street/rails to a height of approximately 0.35 metres (m) and will be approximately 40m in length. The platforms will be low level, reducing their visual impact in the townscape and facilitating access for the mobility impaired. Island platforms will be 3m wide and side platforms will be 4m wide. Ramps will be provided at the end of each platform to provide access for the mobility impaired. Tram stops will incorporate small shelters, seating, lighting, public address system, and information panels. Ticket machines may also be provided. Closed circuit television systems (CCTV) will be installed at each stop to provide security. CCTV cameras will be attached to poles constructed specifically for this purpose.

Tram stops will also require storage for electrical and signalling equipment. This storage may be provided either by a Stop Equipment Room which can be built underground, or by an above ground control box. Control boxes are generally metal units with a 1-2m frontage, up to 1m depth and 1.5m high.

The design of tram stops, including materials, is discussed further in *Section 2.4*.

2.3.4 Power Supply

The tram system will be powered by electricity fed through suspended overhead cables, known as Overhead Line Equipment (OLE). The OLE will be supported in various ways according to circumstances along the route. These may include fixings on neighbouring buildings, poles in the central reservation of roads or off street sections, or kerbside poles on on-street sections. In on-street sections supports will be integrated as far as possible with other street furniture (lighting columns etc).

These issues are addressed in detail in the Design Manual for the scheme (see *Section 2.4*) and the final details of OLE supports and fixings will be subject to approval at a later stage through the process of Prior Approvals (see *Section 3.2.3*).

The electricity supply will be taken from a series of sub-stations (see below) and then via underground ducts to the OLE system where it will be fed through the poles via isolators at 750 volts direct current (dc) to the feed cable which is suspended above the tramway by the poles and fixings. All equipment will be insulated or earthed for public safety.

2.3.5 Sub Stations

Power supply for the tram will be provided from nine sub stations around the route at approximately 2km spacing. A switch room is required in the vicinity of each sub station. Sub stations will require small buildings to house the power supply equipment and may be located either above ground or below ground, depending upon the location. Above ground sub stations are approximately 3m to 3.5m high and cover an area of approximately 75m^2. Sub stations will not all be located within the limits of deviation for the scheme, and some may be located some distance from the tram alignment on land to be acquired as part of the scheme.

2.3.6 Junction Design

Some road traffic junctions affected by the tram will require modification and re-design. In many cases this will involve minimal works associated with construction of the tram tracks, power systems and new signalling to control vehicle movements. However, complex junctions will involve more significant remodelling. These include:

- Haymarket, where integration of the tram and tram stop with the current complex road junction and with the railway station will require realignment of a number of roads and changes to the layout of the junction including traffic islands. This reconfiguration work will also take account of proposals for future upgrading of Haymarket railway station being developed independently of the tram.

- Starbank, at the junction of Starbank Road and Craighall Road where the tram tracks divide through the junction.

- The foot of Leith Walk at the intersection of Constitution Street, Leith Walk, Junction Street and Duke Street. This is a complex traffic signalled junction and adjustment of the traffic lanes and traffic signal timings will be needed to integrate the tram on the alignment from Leith Walk to Constitution Street.

- Picardy Place where two major road intersections will require significant remodelling. These are the current roundabout where Leith Walk joins London Road, and the adjacent Picardy Place roundabout where York Street connects with Leith Walk and Leith Street. In both of these locations the existing roundabouts will be removed and replaced by a series of signal controlled junctions and smaller islands.

At junctions where the tram interfaces with road traffic, traffic signals will be changed such that priority will be afforded to the tram. Traffic signals at junctions for the tram will be linked to urban traffic controls and will require small pillars or cabinets to house the vehicle recognition system.

2.3.7 Cycleways and Footways

Where there is sufficient space in the design of the tram, cycleways will be provided as designated routes for cyclists. In particular, the design of the tram alignment along the former railway corridor between Roseburn and Ferry Road incorporates a combined footway and cycleway to the side of the twin track tramway.

Provisions for cyclists will also be made at all remodelled junctions, including the use of advance cyclist stopping areas at traffic signals, wherever possible. Footways will be retained along the majority of streets where the tram alignment is proposed and footway capacity is planned to be increased on Princes Street. On Constitution Street in Leith there will be some loss of footway width on the western side of the street at its southern end, however footways on the eastern side will be retained throughout.

2.3.8 Other Infrastructure

Other infrastructure associated with the tram includes track control equipment. This will comprise small power supply pillars in a number of locations to isolate the power supply in emergency situations.

2.3.9 Tram Depot

A depot will be required to provide maintenance and stabling facilities for trams using Line One. The proposed depot site is in Leith Port, at the north eastern corner of the Line One loop at the northern end of Constitution Street. The site covers an area of approximately 3 hectares.

The depot will accommodate facilities required to service a Line One fleet size of 14 tram vehicles. The site layout is expected to comprise a single large maintenance shed, up to 8m high with an approximate floor area of 90m x 30m. This will be a single storey building with an overhead travelling crane for maintenance purposes. The building will incorporate offices and a control room. A large open area will be required for stabling, and cleaning and servicing of trams as well as a turnback facility to allow trams to turn around.

The depot will provide the following facilities:

- stabling tracks and inspection platforms;
- integral floor access pits and inspection platforms;
- control room and communications centre;
- maintenance equipment including a wheel lathe;
- automated vehicle washing facility;
- other mechanical and electrical equipment including a substation;
- materials storage and laydown areas, including for vehicle delivery;
- two sub stations; and
- road access and parking for employees, visitors and deliveries.

The environmental impacts of the development, construction and operation of the depot have been assessed as part of the overall tram system in the remainder of the ES.

2.4 Scheme Design

The proposed route passes through a large number of sensitive townscapes including the World Heritage Site in the city centre and a number of Conservation Areas (see *Chapters 8* and *11*). Throughout the period of design development for the scheme, a factor of over-riding importance has been the sensitivity of the built environment through which the scheme passes and the need to ensure that a high quality design is developed, built and maintained. This will require particular care in the design and specifications for tram stops, OLE support and other infrastructure, and the materials which are used for construction. To ensure that the system which is delivered meets the requirements for high aesthetic and design quality and the aspirations of many important stakeholders in Edinburgh, a Design Manual is being prepared in consultation with several organisations including CEC, Historic Scotland and the Edinburgh World Heritage Trust.

The Design Manual will set out the principles of design to be followed to ensure delivery of a high quality tram system meeting the aspirations of all stakeholders including the public and visitors to Edinburgh. The introduction of a major infrastructure project, such as the tram system, into an established urban context of the highest quality will, by its very nature, create a significant change. The new system must therefore make a positive contribution to the city through the medium of good design. This will be applied through a holistic process, in which all aspects are well resolved and integrated with their context to provide an elegant and accessible resource. The Design Manual will:

- identify the Key Issues;
- formulate Design Principles that address these issues;
- provide Design Guidance and;
- set out clear Design Requirements.

It will be in two parts:

- Part 1: Strategic Principles;
- Part 2: Design Parameters relating to all elements of the tram's infrastructure.

The manual will include proposals relating to:

- minimising vertical elements of tram infrastructures, in particular OLE poles and cabling;
- careful design of tram infrastructure to provide a sensitive, considered, and positive fit with the urban context in order to minimise visual impact, and to reflect the high quality aesthetic surroundings;
- use of high quality materials appropriate to different sections of the tramway and associated works including stops.

A draft of the Design Manual forms part of the evidence presented to the Scottish Parliament in support of the Bill for the scheme. The final version of the Design Manual will be incorporated in the contracts for final design and construction of the tram system.

It is also intended that the Design Manual should act as a reference point against which submissions to CEC for Prior Approval will be assessed (see *Section 3.2.3* on Prior Approvals).

Further discussion of the Design Manual and its role in mitigation for the scheme is presented in *Chapter 8: Townscape and Visual Impacts*.

2.5 Construction of the Tram

2.5.1 Construction Period

For the purposes of this ES a total construction period of 36 months (excluding programme optimism bias) is estimated for Line One, with commencement of construction work expected in mid 2006. This includes diversion of public utilities before the main construction programme for the tram begins. These works are required in advance so that disruption is minimised and to prevent accidental damage to utilities during tram construction.

2.5.2 Construction Activity Sequence

Following diversion of services and utilities, the general phasing of tramway construction is expected to include:

- site clearance works, including demolitions and removal of hard landscaping where required;
- general excavation and earthworks, including removal of materials from the former railway corridor;
- construction of new and modification to existing structures including associated earthworks and temporary works;
- installation of drainage, ducts and stray current protection beneath the track formation;
- laying of granular capping material where required, prior to laying of the sub base which support the concrete formation;
- fixing of reinforcements for the formation and laying of the first stage of concrete;
- installation of rails and completion of stray current protection;
- completion of drainage and ducting above the first stage concrete;
- laying of second stage concrete around the tram rails;
- construction of tram stops and installation of main cabling and signalling;
- completion of accommodation works and works to road carriageway including final surfacing, streetscape works;
- installation of OLE supports, wiring and completion of cabling; and
- testing and energising of power supply systems, and commissioning.

It is expected that clearance works and construction of the depot would be undertaken in parallel with the activities listed above for the tramway. A more detailed description of the construction activities undertaken at each stage in the sequence described above is presented in *Appendix A* to the ES.

2.5.3 Tramway Construction and Earthworks

Construction of the on-street alignment is likely to progress along a series of work sections which will be fenced off from traffic and public access. In constrained city centre areas these sections will be short, typically 100-200m in length, however much longer sections are likely to be developed at any one time outwith the central area. More than one section is likely to be under construction simultaneously. Within each section all necessary excavations, drainage and ducting, laying of foundations and tramway slabs will be undertaken. Construction of infrastructure such as tram stop platforms will also be progressed as far as possible prior to moving on to the next section. Once all sections are completed, OLE support poles will be installed and wiring and completion of stops and other operational equipment will be undertaken.

In areas where significant structural works are required in addition to laying of the tramway, the sequence of working will be more complicated and access to the construction area for the structure will determine the phasing of works. The key areas where earthworks and new structures are required are:

- along the route of the former railway corridor where spoil removal and construction of retaining structures is needed. This section will also involve works to bridges and a structure will be required to ramp down from the railway corridor to street level at Ferry Road (this is discussed further in *Section 2.5.4*);

- at Starbank Road where works are required to the seawall to construct a walkway. This is discussed further in *Section 2.5.5*.

An estimate has been made of the quantity of earthworks, spoil and other materials for construction of Line One. These estimates are set out below in *Table 2.1*.

Table 2.1 Earthworks and Construction Materials

Material	Quantity [1]
Excavation of Materials (on Street Sections):	
• Tramway slab	75,000 m^3
• Drainage and ducts	15,000 m^3
• Accommodation works	40,000 m^3
• Structures	15,000 m^3
• Road Planings	10,000 m^3
Import of Materials	
• Capping	20,000 m^3 [2]
• Rail track	63,000 metres of rail
• Concrete	60,000 m^3
• Sub base	55,000 m^3
• Asphalt surfacing	20,000 m^3

[1] The figures quoted are indicative only and estimated to the nearest 5,000 m^3. It has been assumed that subgrade is generally in good condition for the on-street sections and that only 25% of these sections would require capping.
[2] Import of capping for sub-base could be reduced by re-using road planings.

Import and export of the materials listed in the table above is expected to be undertaken using heavy goods vehicles (HGVs). For the purposes of this ES assumptions have been made about the location of potential construction compounds on sites around the loop of Line One, and about the likely access routes to these compounds for HGVs. Although the exact haul routes and construction working and storage areas have not been defined at this stage, HGV routes will be agreed by the contractor with CEC to avoid traffic disruption and effects on amenity of residents and non motorised road users.

The effects of scheme construction on traffic, transport and severance are assessed further in *Chapter 5*. Employment associated with construction has been estimated and is discussed further in *Chapter 12: Socio Economic Effects*.

Construction working hours will be agreed with CEC Environmental and Consumer Services Department. Consultations with this department during preparation of the ES indicate that routine working hours are likely to be 07.00 to 19.00 from Monday to Saturday. Construction work will be required outside these hours for various reasons including avoidance of traffic disruption at junctions, but will only be undertaken with the prior agreement of the Council.

2.5.4 Construction in Roseburn Railway Corridor

The proposed route for Line One follows the alignment of the former railway corridor between Roseburn and Ferry Road. The southern part of this section, between Roseburn and Queensferry Road; is characterised by deep cuttings and elevated embankments. Although the current alignment is used as a walking route and cycleway, in some areas it is not sufficiently wide in its present

configuration for the two tram tracks and adjacent cycleway/footway. In these locations, particularly in cuttings, excavation works will be required to widen the alignment of the track bed (formation).

Excavation is also needed to lower the level of the formation (by up to 1m in some locations) so that trams will be able to pass under bridges which cross the corridor. These works will result in the generation of surplus spoil, some of which has the potential to be contaminated (see *Chapter 7: Geology, Soils and Contaminated Land*). The contractor will be required to adopt all relevant regulatory and best practice procedures in excavating, storing, removing and disposing of potentially contaminated soils.

Construction in some locations will require retaining structures of up to 3m in height at the bottom of the cutting slopes. This will require import of concrete and reinforcing materials to construct the retaining walls, in addition to the materials required to construct the tramway, rails and other infrastructure.

Construction within the railway corridor is likely to involve relatively long working sections since there will be fewer constraints than with city centre on-street working. The contractor will determine the length of the area under construction at any one time, but will be required to ensure that provision is made for pedestrians and cyclists who currently use the railway corridor. This provision may involve alternative signed diversions if it is not possible to maintain public access to the railway corridor during construction. Access by HGV to the railway corridor will depend upon permitted haul routes and availability of locations where roads are close to the railway corridor. Access is likely to be achieved from locations such as Haymarket Yards at Roseburn, South Groathill Avenue at Craigleith, and Ferry Road at the point where the tram alignment leaves the railway corridor. From these (and other) access points, materials will be moved by vehicles along the length of the corridor. Further details of construction traffic movements to and from construction compounds and working areas is provided in *Chapter 5*.

2.5.5 Construction at Starbank Road

The tram alignment follows Starbank Road in Trinity for a distance of approximately 500m between Trinity Crescent and Newhaven Harbour. In this location Starbank Road runs parallel with, and adjacent to the Firth of Forth. The northern footway of the road lies directly on top of a masonry and brick seawall. Integration of the tram along this section of road will require widening of the road to provide for trams, traffic, parking bays and a footway on the southern side of the road in front of existing residential properties. The photograph in *Figure 2.3* shows a view of the existing seawall at Starbank.

A number of options for widening of this section of Starbank Road have been considered (see *Section 3.4.2*). The preferred option, which has least impact in terms of incursion into the foreshore (part of an area of European importance for nature conservation (see *Chapter 9: Ecology and Nature Conservation*)) involves the proposed relocation of the northern footway on the seaward side of the seawall through construction of a number supporting columns, 25m apart, founded onto a reinforced concrete toe onto which is placed a new decking structure for the footway (see *Figure 2.4*). The assessment is based on this proposal but it will be subject to further investigation and consideration by statutory authorities under the terms of the *Conservation (Natural Habitats &c) Regulations 1994*. Construction over the seawall will entail incursion into the area of the Firth of Forth Special Protection Area (SPA) designated under the European Directive on Protection of Wild Birds (see *Chapter 9*). Under this directive any proposal with the potential to affect the qualifying interests of an SPA must be subject to an appropriate assessment before development consent can be granted.

Figure 2.3 Starbank Seawall Looking East

Construction of the proposed footway will require access by machinery and personnel onto an area of the foreshore spanning a distance of approximately 250m along the sea front. The works will involve the use of cranes, concrete plant, excavators and compressors, and a construction period of around 25-35 weeks is anticipated. The plant and vehicles are likely to access the foreshore in front of the sea wall by means of a temporary access road from Starbank Road. Vehicular access to the site will be carefully sited to avoid a geological Site of Special Scientific Interest (SSSI) associated with the coastal rock outcrops at Wardie Shore, at the western end of the seawall (see *Chapter 7: Geology, Soils and Contaminated Land*). Plant is likely to be stored in a compound located remotely from the working area in a location which is unaffected by the tidal range.

The contractor will be required to implement mitigation measures to minimise the potential for environmental impacts from the construction working area along the seawall, in particular impacts on the habitat of the foreshore and water quality of the Firth of Forth. Temporary cofferdams (1) may be used to provide separation of the working area from the remainder of the foreshore.

2.5.6 Construction Access and Temporary Construction Compounds

Access to construction sections will be taken from existing roads along on and off street sections. Arrangements will vary according to the circumstances around the route with delivery and pick up points and access routes assigned to minimise disruption to local traffic and services. On the Roseburn Corridor the main access is likely to be taken from Ferry Road at the northern end and Haymarket Yards at the south, and vehicles will then travel along the corridor to the working area. Level access may also be taken at South Groathill Avenue and near Craigleith Retail Park.

Seven potential sites for temporary construction compounds have been identified around the route. The main one will be at the depot site in Leith and will accommodate site offices, and amenity areas, storage, testing and commissioning facilities.

(1) A cofferdam is a temporary wall structure which is constructed around the proposed working area in order to keep the sea out of the working area.

Potential locations for smaller compounds have been identified at:

- a vacant site at Morrison Street/Haymarket;
- Roseburn Terrace Bridge;
- the Fire training Ground at ferry road;
- a site at Granton Crescent/Granton View;
- Halmyre Street/Smith's Place on Leith walk;
- Waverley Station car park.

These sites are indicative of those which may be used as construction compounds around the route, and have been identified to inform the assessment of the traffic and environmental effects of construction of Line One in this ES. The final choice of compound locations and the responsibility for agreements with landowners for these, or other, construction compounds will be the responsibility of the contractor or concessionaire for the tram.

Further information on access arrangements is presented in *Chapter 5* and final details of locations will be subject to agreement with landowners and later approvals.

2.5.7 Environmental Management and Community Liaison during Construction

Effective liaison by the tram contractor with the communities and businesses along the route of the construction works will be essential and the contractor will be required to contribute to and participate in a consultation programme. This will include circulation of information about ongoing construction works (such as periods of noisy construction activity, road closures and diversions, works affecting footways *etc*) and a telephone number for use by the local community to obtain information. The telephone will be attended during all operational hours and a person with the appropriate authority to respond to calls and resolve any problems that occur will be available. A log of all complaints and actions taken will be available for inspection by the public.

The contractor will be required to securely fence off the area of the works in advance of construction in order to protect public safety and ensure that there is no unauthorised access to the site.

The contractor will also be required to implement an Environmental Management System (EMS) which meets the requirements of ISO 14001 (1) for the construction works. This system, which will be approved by **tie** and the City of Edinburgh Council, will detail procedures to manage activities which have the potential for environmental impacts. It will be supported by appropriate training of site staff at the start of the construction period and throughout as required. The contractor's compliance with the EMS will be audited at regular intervals during the works by client's representative(s) on site.

Community Liaison Groups (CLGs) will be established prior to construction to ensure continuity of public consultation with affected residents in sensitive areas. CLGs will provide a forum for local residents to discuss the design, mitigation and management of the construction work.

(1) ISO 14001 is the international standard for environmental management system (International Standardisation Organisation, 1996).

2.6 Tram Operation

2.6.1 Operational Assumptions

The operational characteristics of the Line One tram, have been developed during the work undertaken in advance of Parliamentary submission to enable an assessment to be made of the economic, engineering, cost and environmental implications of the proposed scheme. The final scheme may differ slightly in its operating characteristics since the contractor or tram concessionaire may elect to specify different vehicles and systems from those assumed for this assessment. However, the assumptions made in developing the case for Line One allow for flexibility and it is not anticipated that the environmental impacts associated with operation of the final scheme will differ significantly from those presented in this ES (see *Section 3.2*).

2.6.2 Tram Vehicles

It is not possible to define the type of tram vehicle which will be selected by the eventual operators of Line One, but the characteristics of a number of different vehicles have been considered at this stage to provide information needed for the assessment. This is based on typical existing tram characteristics and is designed to not unduly restrict selection during the procurement stages of the scheme. New technologies may emerge which provide opportunities for significant environmental benefits, for example wireless trams avoiding the need for OLE, but these cannot be assumed at this stage.

The tram vehicles are assumed to be electrically powered with have a maximum operating speed of 80 km/hr. A single tram vehicle will be approximately 40m in length with a width of approximately 2.65 m and with 80 seats for passengers. The vehicles have been assumed to be semi-low floor which means they will have a floor height above ground level of between 300mm and 400mm. This will allow easy boarding for all users. They are expected to operate under normal circumstances as single units with capacity for 80 seated passengers and 230 in total, however the design will also allow for two vehicles to be coupled together to provide additional passenger capacity in busier periods.

2.6.3 Operating Characteristics

The basic service pattern for the tram is a continuous loop running in both directions with layover facilities at locations where trams can wait alongside the main track, effectively on a siding. During layovers trams will be held in one location for a few minutes (5 minutes maximum) in order to keep a safe operating distance (headway) between successive trams along the route and to maintain an even timetabling distribution of trams (*ie* to prevent bunching of trams). Layovers may also be required for drivers changing ends (if reversing), resetting of controls and destination displays. Possible locations for layovers are at Ocean Terminal and somewhere between Queen Street and the top of Leith Walk.

Line One of the tram will connect with a second proposed line, Line Two (see *3.2.5*), at the extreme southern end of the former Roseburn Railway Corridor. Trams from Line Two are planned to travel eastwards as far as either St Andrew Square or Ocean Terminal. Line Two trams will turn back in the city centre along the loop around St David Street, Princes Street, St Andrew Street and Queen Street. This loop will also be used by Line One trams if they have to turn back, for example when Princes Street is closed for events. Line Two tram vehicles will not continue any further west than Ocean Terminal where a further turnback facility will be provided.

Line Two will be subject to a separate Parliamentary submission and a separate Environmental Statement, however, potential cumulative impact from joint running with Line One are discussed in *Chapter 15*.

During the operation of the tram system, it is envisaged that up to 8 trams per hour will run in each direction (*ie* one tram each way about every seven or eight minutes) during the periods of peak operation. Each tram will be able to transport up to 230 passengers (80 seated), although a planning

standard of 200 passengers per tram has been assumed, making the total line capacity 1,600 passengers per hour.

During off peak periods, fewer trams will run on the route. The operational frequencies which have been used for the assessment are presented in *Table 2.2*.

Table 2.2 Tram Line One Assumed Operating Frequencies

Weekday	Period	Times of Operation	Trams Per Hour on Line One Network		
			Line One Trams Only	Line One & Line Two Trams, Roseburn to St Andrew Square	Line One & Line Two St Andrew Square to Ocean Terminal
Monday to Friday	Early Morning	05.00 to 07.00	4	8	6
	AM Peak	07.00 to 09.30	8	16	12
	PM Peak	16.30 to 19.00	8	16	12
	Interpeak	09.30 to 16.30	8	16	12
	Evening	19.00 to 24.00	4	8	6
Saturday	Early Morning	05.00 to 09.00	4	8	6
	Shopping Hours	09.00 to 18.00	8	16	12
	Evening	18.00 to 24.00	4	8	6
Sunday	Early Morning	07.00 to 10.00	4	8	6
	Daytime	10.00 to 18.00	4	8	6
	Evening	18.00 to 24.00	4	8	6

This table also shows the frequencies of trams which will operate from Line Two onto part of the Line One network. The additional cumulative environmental impact of these additional trams operating on the Line One network has been assessed in *Chapter 15*.

The total run time of a tram completing a circuit of the Line One loop is estimated as 40.5 minutes, excluding any allowance for layover time.